Chapter 6 · How Forces Affect Motion

PLAY & LEARN

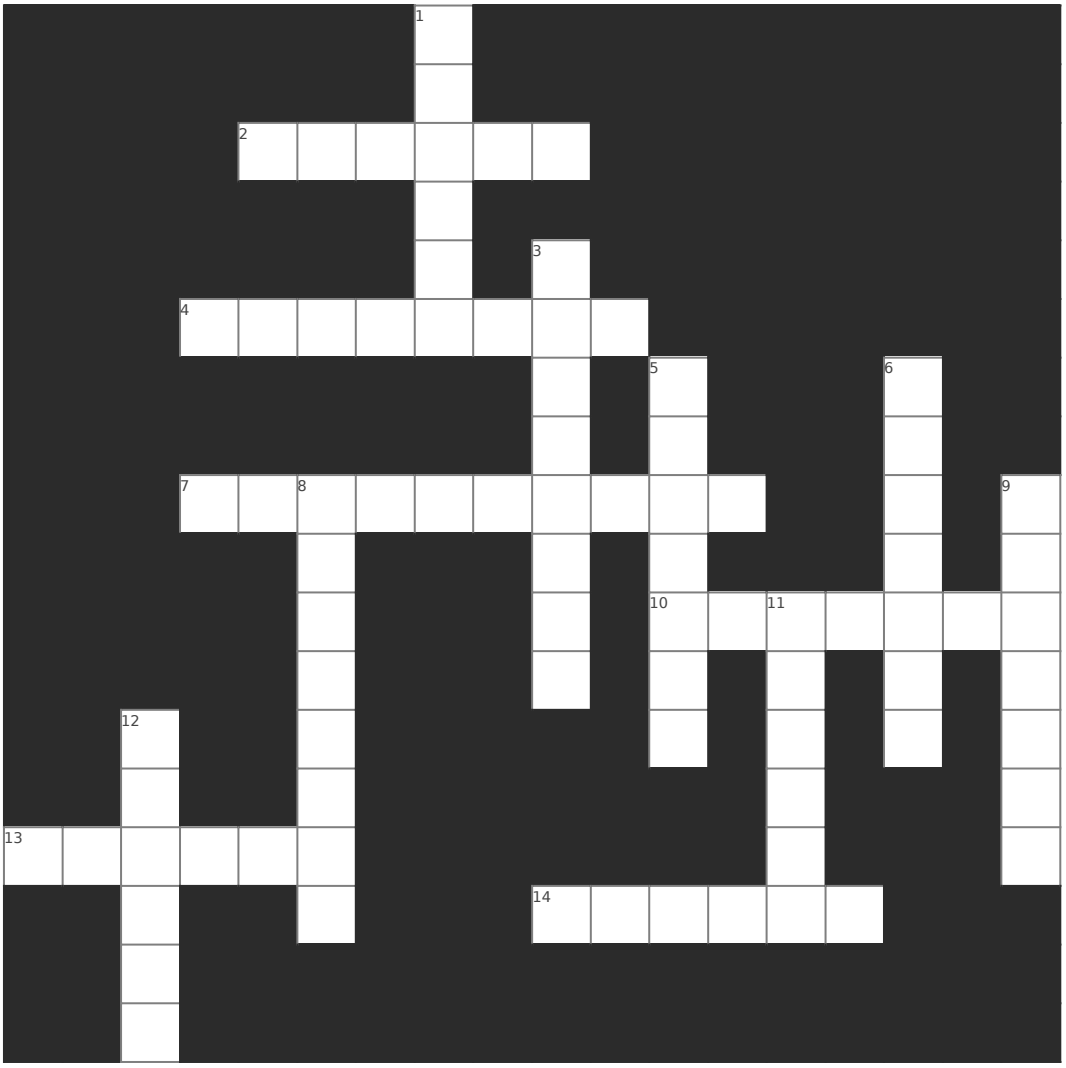
A puzzle workbook — crosswords, word searches, scrambles and quiz games

Print it. Solve it. Race a friend. Answer keys are at the back — no peeking.

#	Puzzle	Play it	Time
1	The Crossword	Solo or pairs	15 min
2	Word Search	Solo — race the clock	10 min
3	Scrambled Terms	Solo	8 min
4	Odd One Out	Teams of 4	10 min
5	Chapter Scrabble	Groups of 3–4	20 min
6	Who Am I? — Clue Cards	Whole class	15 min
7	True or False Sprint	Whole class, standing	6 min
8	Bingo	Whole class	15 min
9	Two Truths and a Lie	Pairs	10 min
10	The Escape Challenge	Teams of 4	25 min

Puzzle 1 · The Crossword

Every answer is a word from this chapter. Fill the white squares — one letter per square.



ACROSS

2. every ____ has an equal and opposite reaction (6)

4. the force that opposes relative sliding between surfaces (8)

7. ____ force — causes a change in motion (10)

10. the pulling force transmitted through a string (7)

13. the turning effect of a force (6)

14. ____ balance — a device that measures force (6)

DOWN

1. the force of gravity acting on a mass (6)

3. mass times velocity (8)

5. a body's resistance to a change in its state of motion (7)

6. the force of attraction between any two masses (7)

8. ____ forces — equal and opposite, produce no acceleration (8)

9. ____ force — requires touching, unlike gravity (7)

11. the SI unit of force (6)

12. ____ force — acts perpendicular to a surface (6)

Puzzle 2 · Word Search

16 terms are hiding in the grid — across, down, diagonally, and backwards. Circle each one, then tick it off the list. Beat 10 minutes and you win.

M	F	O	R	C	E	S	B	M	N	H	M	B	C	L
W	I	C	L	F	R	E	M	K	E	H	A	N	K	X
E	V	C	A	S	R	T	Y	X	W	N	T	N	T	S
Z	D	V	M	R	V	I	E	U	T	E	Y	O	H	Z
H	C	X	R	A	A	E	C	U	O	U	H	I	G	J
I	U	T	O	I	Z	V	K	T	N	Q	S	T	I	R
Y	U	E	N	T	E	C	M	A	I	R	U	C	E	T
T	S	N	X	R	K	O	M	O	N	O	P	A	W	S
I	Y	S	I	E	M	N	H	A	M	T	N	E	G	D
V	D	I	R	N	B	T	P	B	T	E	A	R	N	R
A	K	O	K	I	O	A	U	Y	Q	I	N	I	I	A
R	Z	N	N	L	E	C	P	R	J	H	X	T	D	Z
G	F	S	S	A	M	T	V	T	O	Q	Y	Y	U	O
D	C	S	D	E	C	N	A	L	A	B	Q	N	L	M
G	Q	K	E	N	D	Y	Q	P	U	E	W	X	N	G

☐ MOMENTUM	☐ FRICTION	☐ BALANCED
☐ REACTION	☐ INERTIA	☐ TENSION
☐ GRAVITY	☐ CONTACT	☐ NEWTON
☐ TORQUE	☐ WEIGHT	☐ NORMAL
☐ KANTA	☐ FORCE	☐ MASS
☐ PUSH		

Race Rules

- **Solo:** find all the words. Note your time at the top of the page.
- **Pairs:** one partner finds across-and-down words, the other finds diagonals. First pair to complete the list wins.
- **Hard mode:** cover the word list. Find as many chapter terms as you can in 5 minutes.
- **Champion move:** for every word you find, say what it means out loud. No meaning, no point.

Puzzle 3 · Scrambled Terms

Every row is a chapter word with its letters shuffled. Unscramble it. The clue in brackets is your lifeline — try to solve without it first.

#	Scrambled letters	Clue	Your answer
1	E N M O U M T M	(mass multiplied by velocity)	_____
2	A N C B N A D U L E	(forces that do not cancel and cause acceleration)	_____
3	C N F O I T I R	(opposes relative sliding between two surfaces)	_____
4	E B M Q R I I L I U U	(a state where net force is zero)	_____
5	I T M D U G E N A	(the size of a force, ignoring direction)	_____
6	E R D I P R N P C A E U L	(the direction of the normal force relative to a surface)	_____
7	N C O T O A T N N C	(a force like gravity that needs no touching)	_____
8	E I E S N S A C R T	(another word closely linked to inertia)	_____

Make It a Game

Beat the Bell: the teacher sets a 60-second timer. Every unscrambled word inside the bell = 1 point; a word you can also *define* = 3 points.

Chain Scramble: in a circle, each student scrambles a chapter word for the person on their left. Miss it and you are out. Last student standing wins.

Puzzle 4 · Odd One Out

Three belong together. One does not. Circle the odd one — then write why in one line. The "why" is where the marks are.

#	Which is the odd one out?	Because…
1	Push · Pull · Twist · Colour	_____
2	Gravity · Magnetism · Friction · Electrostatic force	_____
3	Newton · Kilogram · Metre · Second (this chapter's star unit)	_____
4	Tension · Normal force · Friction · Gravity (contact vs non-contact)	_____
5	Balanced forces · Zero acceleration · Constant velocity · Speeding up	_____
6	Spring balance · Tarazu · Kanta · Thermometer	_____

Puzzle 5 · Chapter Scrabble

Play in groups of 3–4. You have one shared rack of letter tiles. Build only terms from this chapter — no ordinary English words allowed.

Your tile rack — cut these out or write them on paper squares:

A 1	**B** 3	**C** 3	**D** 2	**E** 1	**G** 2	**H** 4
I 1	**L** 1	**M** 3	**N** 1	**O** 1	**P** 3	**R** 1
S 1	**T** 1	**U** 1	**V** 4	**X** 8	**Y** 4	**Z** 10

Scoring:

You did this	Points
Each letter tile used	Its tile value
Word is a term from this chapter	× 2
Word is 8 letters or longer	+ 10 bonus
You can state its meaning correctly	+ 5
You can connect it to a real-life example	+ 3
Word is *not* in this chapter (challenged and lost)	− 5

How a Round Works

1. Player builds a word from the rack and lays it down.
2. Any opponent may **challenge** within 10 seconds: "That's not in this chapter."
3. Open the textbook. If the challenger is right, the word is removed and the builder loses 5 points. If the challenger is wrong, the *challenger* loses 5 points.
4. Builder states the meaning to claim the +5 bonus. The group votes on whether it was correct.
5. Play 6 rounds. Highest total wins.

Target Words (worth the most — do not show your opponents)

MOMENTUM · EQUILIBRIUM · UNBALANCED · PERPENDICULAR · FRICTION · TENSION · GRAVITY · TORQUE

Puzzle 6 · Who Am I? — Clue Cards

Cut along the lines. One student draws a card and reads only the first clue aloud; the class guesses. Wrong guess? Read clue 2. Fewer clues used = more points.

CARD 1 ① I am a body's resistance to changing its motion. ② A sudden bus brake reveals me in your own body. ③ I am inertia.	**CARD 2** ① I am mass multiplied by velocity. ② A moving truck has more of me than a moving bicycle at the same speed. ③ I am momentum.
CARD 3 ① I am the SI unit of force. ② I am named after a famous scientist. ③ I am the newton.	**CARD 4** ① I pull through a taut string. ② A kite stays up partly because of me. ③ I am tension.
CARD 5 ① I oppose relative sliding between two surfaces. ② Without me you could not walk. ③ I am friction.	**CARD 6** ① I am the turning effect of a force. ② Opening a door with a push far from the hinge uses more of me for less effort. ③ I am torque.
CARD 7 ① When we are equal and opposite, nothing accelerates. ② When we are not equal, something starts moving. ③ I am a pair of forces (balanced/unbalanced).	**CARD 8** ① I act perpendicular to a surface. ② I hold you up when you stand on the floor. ③ I am the normal force.
CARD 9 ① I attract any two masses toward each other. ② I keep the Moon orbiting Earth. ③ I am gravity.	**CARD 10** ① I am the force of gravity acting on your mass. ② I change on the Moon even though your mass does not. ③ I am weight.
CARD 11 ① For every one of me there is an equal and opposite reaction. ② I am Newton's Third Law in one word. ③ I am action.	**CARD 12** ① I need no contact at all. ② Gravity and magnetism are examples of me. ③ I am a non-contact force.

Scoring: guessed after clue ① = **5 points** · after ② = **3 points** · after ③ = **1 point**

Puzzle 7 · True or False Sprint

Everyone stands. Teacher reads a statement. True → stay standing. False → sit down. Get it wrong and you are out. Last student standing wins.

#	Statement	Your call
1	Inertia is a body's tendency to resist a change in motion.	☐ True ☐ False
2	Momentum is mass divided by velocity.	☐ True ☐ False
3	The newton is the SI unit of mass.	☐ True ☐ False
4	Friction always acts to oppose relative motion.	☐ True ☐ False
5	Balanced forces cause an object to accelerate.	☐ True ☐ False
6	An unbalanced force changes an object's state of motion.	☐ True ☐ False
7	The normal force acts parallel to a surface.	☐ True ☐ False
8	Gravity is a non-contact force.	☐ True ☐ False
9	Weight changes depending on gravitational field strength; mass does not.	☐ True ☐ False
10	Every action has an equal and opposite reaction.	☐ True ☐ False
11	Torque is the turning effect of a force.	☐ True ☐ False
12	Tension can only push, never pull.	☐ True ☐ False
13	A heavier object always has more inertia than a lighter one.	☐ True ☐ False
14	A spring balance measures mass directly.	☐ True ☐ False

Puzzle 8 · Bingo

Each student fills the empty grid below with any 16 words from the word bank — in any order, one per box. The teacher then reads out meanings, not names. Cross a box only when its meaning is called. First to a full row, column or diagonal shouts BINGO.

Word bank — choose any 16:

Inertia	Momentum	Newton	Tension
Friction	Torque	Balanced force	Unbalanced force
Normal force	Gravity	Weight	Spring balance
Contact force	Non-contact force	Action-reaction	Equilibrium

Your bingo card:

Caller’s List (teacher only — read the meaning, never the name)

① "I am resistance to a change in motion." ② "I am mass multiplied by velocity." ③ "I am the SI unit of force." ④ "I pull through a taut string." ⑤ "I oppose relative sliding between surfaces." ⑥ "I am the turning effect of a force." ⑦ "When equal and opposite, I produce no acceleration." ⑧ "I act perpendicular to a surface." ⑨ "I attract any two masses toward each other." ⑩ "I am the force of gravity on a mass." □ "I need touching to act." □ "I need no touching to act at all." □ "For every one of me there is an equal and opposite reaction."

Puzzle 9 · Two Truths and a Lie

Each set has three statements. Two are true, one is a lie. Circle the lie — and correct it in one line.

Set 1

(a) A heavier object has more inertia.

(b) Inertia depends on velocity.

(c) Inertia is why you lurch forward when a bus brakes.

The lie is _____ . Corrected: _____

Set 2

(a) Balanced forces cause zero acceleration.

(b) Balanced forces cause an object to speed up.

(c) A book resting on a table experiences balanced forces.

The lie is _____ . Corrected: _____

Set 3

(a) Weight is the same as mass.

(b) Weight changes with location (Earth vs Moon).

(c) Mass stays the same everywhere.

The lie is _____ . Corrected: _____

Set 4

(a) Friction always helps motion.

(b) Friction can be reduced by lubrication.

(c) Friction opposes relative sliding.

The lie is _____ . Corrected: _____

Puzzle 10 · The Escape Challenge

Solve all five gates. Each gives you one digit. Collect all five to unlock the exit code.

🔒 GATE 1 — The Inertia Gate

Count the letters in INERTIA.

Digit: ☐

🔒 GATE 2 — The Force Gate

How many of Newton's Laws of Motion are there? Use that number.

Digit: ☐

🔒 GATE 3 — The Contact Gate

How many contact forces are named in this chapter (tension, normal, friction)? Use that number.

Digit: ☐

🔒 GATE 4 — The Momentum Gate

Momentum = mass × velocity. Count the words in that formula's definition (three words: mass, times, velocity). Use that number.

Digit: ☐

🔒 GATE 5 — The Torque Gate

Count the letters in TORQUE.

Digit: ☐

EXIT CODE: ☐ ☐ ☐ ☐ ☐

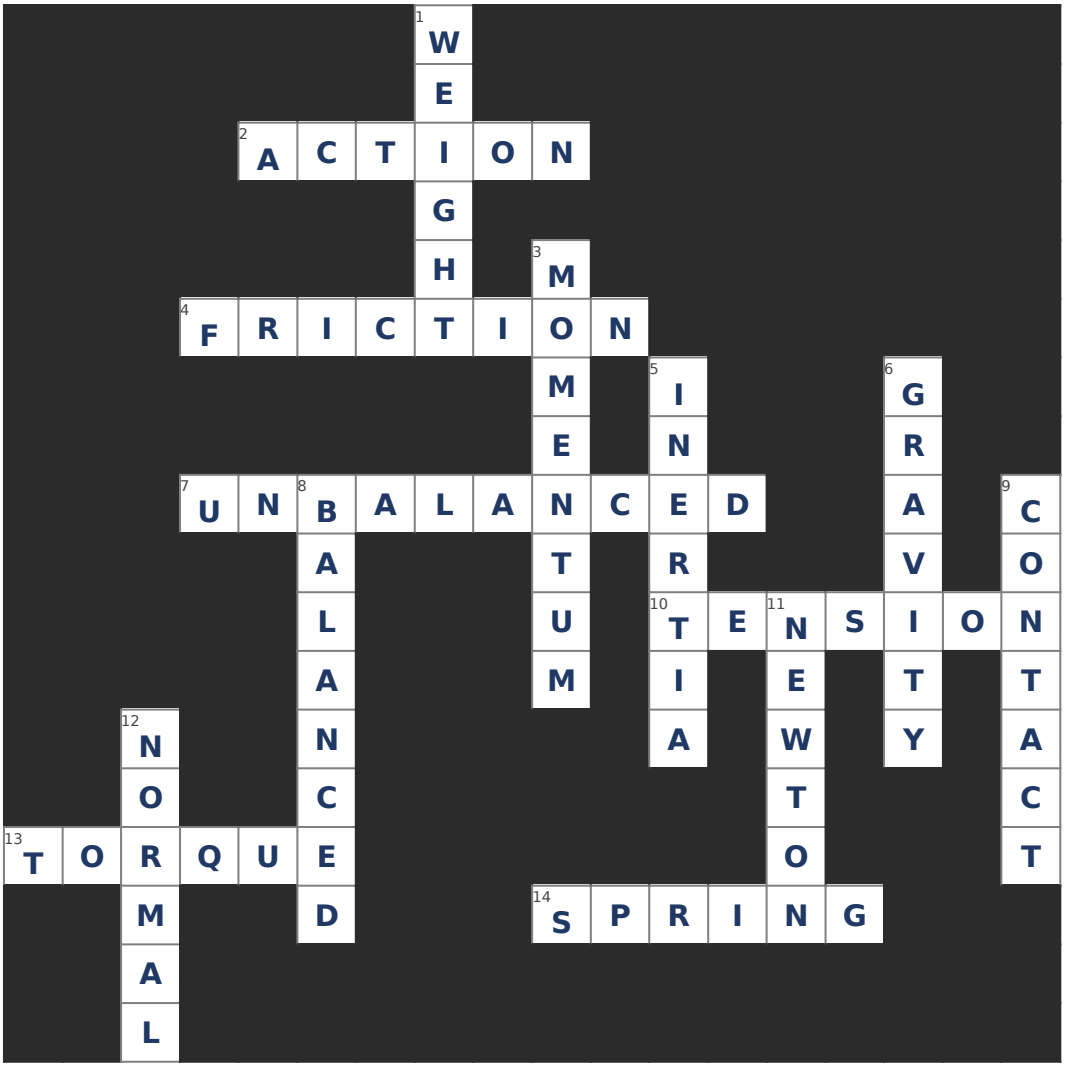
🔒 Teacher's note

Hide the gate cards around the classroom. Teams rotate every 4 minutes. First team to reach the door with the correct code escapes. Losing teams try again next period.

Answer Keys

Teachers and self-checkers only. Solve first — the puzzle is the point.

Puzzle 1 · Crossword — Solved Grid



Across: 2 ACTION · 4 FRICTION · 7 UNBALANCED · 10 TENSION · 13 TORQUE · 14 SPRING

Down: 1 WEIGHT · 3 MOMENTUM · 5 INERTIA · 6 GRAVITY · 8 BALANCED · 9 CONTACT · 11 NEWTON · 12 NORMAL

Puzzle 2 · Word Search — Solved Grid

M	F	O	R	C	E	S	B	M	N	H	M	B	C	L
W	I	C	L	F	R	E	M	K	E	H	A	N	K	X
E	V	C	A	S	R	T	Y	X	W	N	T	N	T	S
Z	D	V	M	R	V	I	E	U	T	E	Y	O	H	Z
H	C	X	R	A	A	E	C	U	O	U	H	I	G	J

I	U	T	O	I	Z	V	K	T	N	Q	S	T	I	R
Y	U	E	N	T	E	C	M	A	I	R	U	C	E	T
T	S	N	X	R	K	O	M	O	N	O	P	A	W	S
I	Y	S	I	E	M	N	H	A	M	T	N	E	G	D
V	D	I	R	N	B	T	P	B	T	E	A	R	N	R
A	K	O	K	I	O	A	U	Y	Q	I	N	I	I	A
R	Z	N	N	L	E	C	P	R	J	H	X	T	D	Z
G	F	S	S	A	M	T	V	T	O	Q	Y	Y	U	O
D	C	S	D	E	C	N	A	L	A	B	Q	N	L	M
G	Q	K	E	N	D	Y	Q	P	U	E	W	X	N	G

Puzzle 3 · Scrambled Terms

1. MOMENTUM · 2. UNBALANCED · 3. FRICTION · 4. EQUILIBRIUM · 5. MAGNITUDE · 6. PERPENDICULAR · 7. NONCONTACT · 8. RESISTANCE

Puzzle 4 · Odd One Out

#	Odd one	Because
1	Colour	push, pull and twist are all types of force; colour is not a force
2	Friction	gravity, magnetism and electrostatic force can act without contact; friction needs contact
3	Newton	kilogram, metre and second are SI base units; the newton is a derived unit
4	Gravity	tension, normal force and friction are all contact forces; gravity is a non-contact force
5	Speeding up	the other three describe balanced-force situations; speeding up needs an unbalanced force
6	Thermometer	the other three are force/weight-measuring devices; a thermometer measures temperature

Puzzle 7 · True or False Sprint

1-T · 2-F · 3-F · 4-T · 5-F · 6-T · 7-F · 8-T · 9-T · 10-T · 11-T · 12-F · 13-T · 14-F

Puzzle 9 · Two Truths and a Lie

Set	The lie	Correction
1	b	Inertia depends on mass, not velocity.
2	b	Balanced forces cause zero acceleration, not speeding up — that needs unbalanced force.
3	a	Weight and mass are different — weight is the force of gravity on a mass.
4	a	Friction usually opposes motion; it does not always help.

Puzzle 10 · The Escape Challenge

EXIT CODE: 7 · 3 · 3 · 3 · 6

(Answer: 7) (Answer: 3) (Answer: 3) (Answer: 3) (Answer: 6)

Now go find three balanced-force situations and three unbalanced ones around your house. ⚖